REMARKS

This is a response to the Office Action dated November 22, 2005, in the above-referenced patent application. Before this response, Claims 1-16 were pending in the above-referenced patent application. Through this response, new Claims 17-21 have been added. As such, claims 1- 21 are now pending in the patent application. No new matter has been added.

Claims 1, 3, 6-10, 14 and 16 were rejected. Claims 1, 3, 6-10 and 16 were rejected under 35 U.S.C. 102(e) as being anticipated by US 2002/0027610 to Jiang et al. ("Jiang"). Claim 14 was rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang in view of USPN 6,275,259 to Gowda et al. ("Gowda"). Claims 2, 4, 5, 11-13 and 15 were deemed allowable if rewritten in independent form including limitations of base claims and all intervening claims.

Rejection of Claims 1, 3, 6-10 and 16 under 35 U.S.C. 102(e)

Rejection of Claims 1, 3, 6-10 and 16 under 35 U.S.C. 102(e) as being anticipated by Jiang is respectfully traversed because, for at least the following reasons, Jiang does not disclose all of the claimed limitations.

As per **Claim 1**, despite the Examiner's interpretation, Jiang does not disclose:

"comparing mutually corresponding fields and defining a point-wise non-

recursive motion decision parameter indicating motion at a given point between a previous field and a next field in the video sequence;

computing a recursive motion decision parameter by combining the non-recursive motion decision parameter with a motion decision parameter of at least one associated previous field," as required by Claim 1.

Applicant respectfully traverses Examiner's interpretation of Jiang's units 107 and/or 109 as disclosing the claimed limitations.

According to the present invention, interlaced video signals are processed by mixing spatially interpolated video signals with temporally interpolated video signals. The respectively interpolated signals are mixed in dependence on a degree of motion at the given location in the video picture, as defined by a motion decision parameter. In order to dependably determine whether motion is to be taken into account in a current frame, motion decisions of previous frames are taken into account. That is, to define the motion decision parameter and to exclude false determinations, the motion decision parameter is computed recursively, by taking into account motion decision parameters of the associated previous fields.

It is noted that the Examiner has not properly considered the complete definitions of non-recursive and recursive in the specification of the present invention. In the following Applicant explains these terms again.

The claimed limitations include: (1) determining a non-recursive motion decision parameter, and (2) determining a recursive motion decision parameter. According to an embodiment of the present invention, a non-recursive motion detection method estimates the non-recursive motion decision parameter from a few number of fields such as x_{n-2}, x_{n-1}, x_n, and x_{n+1}. A recursive motion detection method further utilizes the motion decision parameters of associated previous fields. As such, motion decision parameters of the associated previous fields are taken into account when the current motion is being decided. In other words, the current motion decision will be made not only by investigating the difference between the frames associated with current motion detection but also by looking at the previous-motion decision parameters. Conversely, when motion is detected at a certain time, this information will be propagated over the time domain to secure the motion detection thereafter from the possible presence of fast repetitive motion. This is a function of the recursive motion detection, as claimed.

By contrast, Jiang does not disclose taking into account motion information of the associated previous fields when the current motion is being decided. In Fig. 3, and Paras 23 and

24, Jiang states that unit 107 determines five pixel luminance value differences Δc, Δn, Δs, Δa and Δb. In Jiang, C_1 represents luminance value of a pixel in field f_1 and C_{-1} represents luminance value of a pixel in field f_{-1}, wherein $\Delta c = |C_1 - C_{-1}|$.

Then, in Para 27, Jiang describes the motion detector 109 detecting motion of a missing pixel as: "The motion metric Δ at a missing pixel may be defined by employing some combination of the obtained pixel luminance value differences, for example, by $\Delta=\max(\Delta_c, \Delta_a)$.... It is also important to note that our implementation is significantly simplified because the motion values are computed directly from the pixel luminance value differences *employing the minimum and maximum value choices.*" (emphasis added).

According to Jiang, the motion metric Δ is simply a max/min of luminance value differences. Therefore, Jiang's motion detector 109 does not compute a recursive motion decision parameter using motion information of the associated previous fields when the current motion is being decided. In Jiang, the luminance value differences Δc, Δn, Δs, Δa and Δb used in calculating the motion metric Δ, are not motion decision metrics of the associated previous fields when computing the motion metric Δ for current motion.

The claimed limitations include: (1) determining a non-recursive motion decision parameter (i.e., $m_n(i,h)$), and (2) determining a recursive motion decision parameter (i.e.,

$M_n(i,h)$). In one example, $M_n(i,h) \approx m_n(i,h) + M_{n-2}(i,h) \approx m_n(i,h) + m_{n-2}(i,h) + M_{n-4}(i,h)$, and so on.

However, Jiang does not disclose a recursive motion decision parameter which is a function of: $\Delta f_0 + \Delta f_{-2} + \ldots$, wherein Δf is a function of luminance value differences Δc, Δn, Δs, Δa and Δb such that, for example, $\Delta c = |C_1 - C_{-1}|$ where C_1 represents luminance value of a pixel in field f_1 and C_{-1} represents luminance value of a pixel in field f_{-1}. The motion detector 109 does not use motion information of the associated previous fields when the current motion is being decided.

Jiang calculates the motion metrics for a missing pixel by first obtaining *pixel luminance value differences* such as Δ_c, Δ_a and then obtaining a motion metric Δ for the missing pixel from *a combination of the luminance value differences*. In contrast to the claimed invention, the *motion metrics* of previous fields are not used by Jiang for computing the motion metric Δ for a missing pixel. Jiang does not disclose computing a motion decision parameter by combining the motion decision parameter Δ of the missing pixel with a motion decision parameter of at least one associated previous field, as required by Claim 1. In Jiang, for computing the motion metric Δ for the missing pixel, the *luminance value differences* (e.g., Δ_c, Δ_a, Δ_n, Δ_s) are used, not the *motion metrics* of any previous fields, as claimed.

The Examiner interprets Jiang (Figs. 1 and 3) to disclose comparing mutually corresponding fields and defining a point-wise non-recursive motion decision parameter, as claimed. However, forming a point-wise non-recursive motion decision parameter, as claimed, is different from Jiang's determination of $\Delta_c = |C_1-C_{-1}|$. In the following Applicant establishes that difference:

> In Jiang, C_1 represents luminance value of a pixel in field f_1 and C_{-1} represents luminance value of a pixel in field f_{-1}. In Fig. 3 and Para 23 and 24, Jiang states that five *pixel luminance value differences* Δc, Δn, Δs, Δa and Δb are obtained, wherein $\Delta c = |C_1-C_{-1}|$. As such Δc is a *pixel luminance value difference*, rather than point-wise motion detection signal, as claimed.

According to an embodiment of the present invention, a frame difference signal D_n is computed as $D_n = |x_{n+1}-x_{n-1}|$, which is associated with changes that occurred between fields x_{n+1} and x_{n-1} in a frame. Next, a point-wise motion decision parameter $m_n = f_n$ is computed based on D_n (wherein f_n is a function of d_n, where $d_n = \text{LPF}(D_n)$). Clearly then, determining the luminance value difference $\Delta c = |C_1-C_{-1}|$ in Jiang, is not the same as computing a point-wise non-recursive motion decision parameter f_n from the frame difference signal D_n.

The Examiner seems to suggest that the motion metric Δc (i.e., $|C_1-C_{-1}|$) is a point-wise non-recursive motion decision parameter m_n as claimed herein. However, as noted, Jiang defines

$\Delta c = |C_1 - C_{-1}|$ as pixel luminance value difference, not a point-wise non-recursive motion decision parameter m_n. In Jiang, $\Delta c = |C_1 - C_{-1}|$ by itself does not provide a point-wise non-recursive motion decision parameter, as claimed. Indeed Jiang in Para 26 Jiang states that the *pixel luminance value differences* Δc, Δn, Δs, Δa and Δb are low pass filtered by the filter 108 to smooth them and the filtered versions are supplied to the motion detector 109 to detect motion to detect motion metric Δ of the missing pixel. Further, in Para 27, Jiang describes the motion detector 109 detecting motion of a missing pixel as follows:

> "The motion metric Δ at a missing pixel may be defined by employing some combination of the obtained pixel luminance value differences, for example, by $\Delta = \max(\Delta_c, \Delta_a)$.... It is also important to note that our implementation is significantly simplified because the motion values are computed directly from the pixel luminance value differences *employing the minimum and maximum value choices.*" (emphasis added).

Accordingly, for at least these reasons, it is respectfully submitted that forming a point-wise non-recursive motion decision parameter, as claimed, is different from Jiang's determination of $|C_1 - C_{-1}|$.

Further, it is respectfully submitted that contrary to the description in Jiang, the Examiner is improperly interpreting Jiang's pixel luminance value differences Δc, Δn and Δs both as frame

difference signals, and as the claimed point-wise non-recursive motion decision parameter. However, Jiang only discloses the pixel luminance value differences Δc, Δn, Δs, Δa and Δb, determined by the difference unit 107. Further, in Jiang Δc, Δn, Δs are simply pixel luminance value differences computed by the unit 107. In addition, the values Δc, Δn, Δs are pixel luminance value differences and not point-wise non-recursive motion decision parameters.

Claim 6 includes limitations of Claim 1, and further limitations, not disclosed by Jiang and is therefore allowable for at least the reasons provided in relation to Claim 1.

As per **Claim 7**, despite the Patent Office's interpretation, Jiang, paragraph 42, does not disclose: "varying the motion decision value between 0 and 1 as a function of an estimate of the degree of motion at the given location and, upon estimating a high degree of motion, heavily weighting the output signal towards the spatially interpolated signal and, upon estimating a low degree of motion, heavily weighting the output signal towards the temporally interpolated signal," as required by Claim 7.

The blending factor in Jiang is not the same as the motion decision value as claimed. The Patent Office has not met its burden in showing that Jiang's blending factor is the same as the motion decision value as claimed. If Claim 7 is once again rejected, Applicant respectfully

requests the Examiner to specifically support the interpretation that Jiang's blending factor is the same as the motion decision value as claimed.

Jiang shows the motion metric values varying between 0 and 8, not between 0 and 1, as claimed. In addition, as claimed, upon estimating a high degree of motion (e.g., motion decision close to 1), the output signal is heavily weighted towards the spatially interpolated signal, and upon estimating a low degree of motion (e.g., motion decision close to 0), the output signal is heavily weighted towards the temporally interpolated signal. By contrast, the blending factor in Jiang has the values of 0 for motion metric values 0, 1, 2 and 3.

Fig. 5 in Jiang (relied on by the Examiner) is explained in Paras 40 and 41 as a graphical representation of a look up table including blending factors that may be used in the interpolation. The look up table is represented as a stretched sinusoidal curve, where the blending factor has 8-bit values. Jiang states that the curve shown in Fig. 5 has significant effects on the quality of the de-interlaced images. Shifting the curve to the left causes more pixels to be interpolated based on field, and therefore reducing aliasing. On the other hand, shifting the curve to the right may increase aliasing. The look up table of Fig. 5 yields the blending factor based on the supplied median motion metric output from spatial median filter 110. Then, the blending factors are supplied to the blender 112.

It is respectfully submitted that there is no disclosure of the claimed limitations in Fig. 5 or corresponding description in Jiang as the Examiner interprets. If Claim 7 is once again rejected, Application respectfully requests the Examiner to specifically support the interpretation that Jiang's Fig. 5 discloses any of the claimed limitations. Further, in paragraph 43, Jiang states that any motion metric value of less than 4 yields a blending factor of 0 and any motion metric value of 8 or more yields a blending factor 1. For at least these reasons, rejection of Claims 7-8 should be withdrawn.

Claim 9 was rejected for similar reasons as Claim 1, and therefore should be allowed for at least the reasons provided in relation to Claim 1.

Claim 16 includes limitations of Claim 9, and further limitations, not disclosed by Jiang and is therefore allowable for at least the reasons provided in relation to Claim 9.

Rejection of Claim 14 under 35 U.S.C. 103(a)

Rejection of Claim 14 under 35 U.S.C. 103(a) as being unpatenable over Jiang in view of Gowda is respectfully traversed because not all of the limitations of the claim are disclosed or suggested by Jiang and Gowda, alone or in combination.

As per Claim 14, as the Patent Office also states, Jiang does not disclose a low-pass filter connected to the output of the recursive motion detection unit to for low-pass filtering the recursive motion detection parameter, as required by Claim 14. Jiang does not disclose all of the limitations of Claim 9 on which Claim 14 depends. Clearly then, Jiang cannot, and does not disclose, low-pass filtering the recursive motion detection parameter before output. There is no such component in Jiang. The Patent Office has summarily deciding that the claimed limitation is obvious, and a matter of design choice, without meeting its burden. No prima facie case of obviousness has been established. Further, unlike the claimed invention, Gowda is directed to a digital automatic gain control circuit for image system. In col. 3, lines 10-21 (relied on by the Examiner), Gowda mentions an optional low pass filter 112 for the DAC 110 in Fig. 1. This has nothing to do with the claimed limitation of low-pass filtering the recursive motion decision parameter output of the recursive motion detection unit, as claimed.

There is no suggestion in Jiang to modify it according to Gowda as the Patent Office does. It is well settled that in order for a modification or combination of the prior art to be valid, the prior art itself must suggest the modification or combination, "...invention cannot be found obvious unless there was some explicit teaching or suggestion in the art to motivate one of ordinary skill to combine elements so as to create the same invention." *Winner International Royalty Corp. v. Wang*, No. 96-2107, 48 USPQ.2d 1139, 1140 (D.C.D.C. 1998) (emphasis added). "The prior art must provide one of ordinary skill in the art the motivation to make the

proposed molecular modifications needed to arrive at the claimed compound." *In re Jones*, 958 F.2d 347, 21 USPQ.2d 1941, 1944 (Fed. Cir. 1992) (emphasis added).

Jiang does not suggest the motivation to modify it as proposed. Jiang and Gowda are individually complete and functionally independent for their limited specific purposes and there would be no reason to make the modification proposed by the Patent Office. Therefore, because Jiang does not suggest the modification proposed by the Patent Office the modifications is improper. The LPF 108 in Jiang has nothing to do with low-pass filtering the recursive motion decision parameter prior to the outputting step, as claimed. Further, it is respectfully submitted that the Patent Office is improperly using "hindsight" and the teachings of Applicant's own claimed invention in order to modify Jiang to render Applicants' claims obvious. For at least these reasons, rejection of Claim 14 should be withdrawn.

New Claims

New claims 17-21 add further limitations to Claim 1 regarding recursive calculations and frame difference signal, which are allowable for at least the reasons provided above.

CONCLUSION

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For these and other reasons, it is respectfully submitted that the rejection of the rejected claims should be withdrawn, and all of the claims be allowed. Accordingly, reexamination, reconsideration and allowance of all the claims are respectfully requested.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 21, 2006.

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2/21/6

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